Most up-to-date set of Claims:

This version is the most up-to-date set of claims from the Amendment version of 9-6-2005.

This listing of claims will replace all prior versions, and listings, of claims in the application:

CLAIMS

What I claim as my invention is:

1 – 5. (Canceled)

6. (Withdrawn) The product made by the process for producing said optical fiber in claim 1.

7 –10. (Canceled)

11. (Withdrawn) The robust diameter-controlled optical fiber made by the process in claim 7.

12–15. (Canceled)

16. (Withdrawn) The product made by the process in claim 12.

17–19. (Canceled)

20. (Withdrawn) The product made by said control method in claim17.

21. (previously presented) A drawing process for producing an optical fiber comprising the steps of:

measuring either the outer diameter or shape of a preform;

feeding said preform into a furnace to heat and melt said preform;

heating and melting said preform for said optical fiber;

while heating and melting, drawing said optical fiber from said preform under tension to form said optical fiber;

measuring the outer diameter of said optical fiber at a position below the furnace;

providing a control system with the measured outer diameter or shape of said preform , the measured outer diameter of said optical fiber, a predetermined nominal preform value and a predetermined nominal fiber value for controlling said drawing process,

wherein the control system controls

feeding speed of said preform and drawing speed of said optical fiber;

whereby said optical fiber drawing process is robustly controlled with robust performance of said process and robust quality of said optical fiber against deviations of the preform outer diameter or shape at different locations and against deviations of various preforms, making a robust diameter-controlled optical fiber.

22. (previously presented) The drawing process as claimed in claim 21, wherein the measurement of said preform outer diameter or shape is on-line by a measurement monitor device;

the measured diameter or shape is on-line real-time fed to said control system; and

said control system generates a control signal based on the measured preform diameter or shape , its deviation from the predetermined nominal preform value, and said nominal preform value,

for controlling said process in face of the deviation of the preform diameter or shape.

23. (canceled)

24. (previously presented) The process as claimed in claim 21, further including the steps of:

generating control signals based on the preform measurement, the fiber measurement, the deviation of the preform measurement from the predetermined nominal preform value, the deviation of the fiber measurement from the predetermined nominal fiber value, the predetermined nominal preform value and the predetermined nominal fiber value, for said optical fiber drawing process control;

whereby further to maintain the robust performance of said drawing process and to provide the robust quality of said optical fiber in presence of the deviations of said outer diameter or shape of said preform.

25. (previously presented) The process as claimed in claim 21,

wherein the position of measuring the optical fiber is at a position at which shrinkage of the outer diameter of said optical fiber is not larger than a predetermined allowable diameter deviation value of said optical fiber;

said control system generates control signals to control the drawing speed of said fiber from the melting preform and the feeding speed of said preform into the furnace, based on the measured preform outer diameter or shape , its deviation from the predetermined nominal preform value, said predetermined nominal preform value, the measured optical fiber outer diameter, its deviation from the predetermined nominal fiber value, and said predetermined nominal fiber value; and

the drawing process being carried out at said drawing speed and said feeding speed .

26. (previously presented) A drawing process for producing an optical fiber comprising the steps of:

heating and melting a preform in a furnace for the optical fiber;

while heating and melting, drawing said optical fiber from said preform under tension to form said optical fiber;

measuring the outer diameters of said optical fiber, which is bare before coating, at two or more different locations by respective measurement devices before the coating,

wherein a first location is close to the furnace, and

a second location is below the first location, at this second location shrinkage of the outer diameter of said optical fiber, while stretched under the drawing, is not larger than a predetermined allowable bare fiber diameter deviation value of said optical fiber, or immediately before the coating;

coating said optical fiber;

providing a control system with the measurement data from all these measurement devices respectively at the different locations,

wherein said control system

has a first preselected nominal value for the measurement data from the first measurement location, and a second different preselected nominal value that is less than the first preselected value for the measurement data from the second measurement location,

calculates the deviation of the measurement of the first measurement location from the first preselected nominal value, and the deviation of the measurement of the second measurement location from the second preselected nominal value, and

dynamically controls a fiber drawing speed and a preform feeding speed for the drawing process based on the calculated deviations ;

whereby to maintain robustly controlled performance of said optical fiber drawing process and robust quality of said optical fiber by double monitoring the changes of the bare fiber diameters.

27. (canceled)

28. (previously presented) The process as claimed in claim 26, further including a measurement of the outer diameter of said preform above the heating and melting;

providing said control system with the measured outer diameter of said preform;

wherein the control of the preform feeding speed and the fiber drawing speed of said drawing process is further based on the measured preform outer diameter, its deviation from a preselected nominal preform diameter, and said nominal preform diameter, in addition to the calculated deviations of the bare fiber.

29. (canceled)

30. (previously presented) A control method for an optical fiber drawing process control including the steps of:

measuring a preform outer diameter by a measurement device located before a heating and melting stage, in which the preform is fed and is changing its geometrical size substantially to form said optical fiber by drawing;

measuring said optical fiber by an outer diameter measurement device located after said heating and melting stage;

providing the preform measurement and the fiber measurement into a control system which controls a feeding speed of said preform into the heating and melting stage and a drawing speed of said fiber;

calculating a preform diameter deviation of the measured preform diameter from a preselected nominal preform diameter value, and a fiber diameter deviation of the measured fiber diameter from a preselected nominal fiber diameter value;

generating control signals based on the preform deviation and the fiber deviation for said optical fiber drawing process control; and

adjusting the feeding speed of said preform and the drawing speed of said fiber as said control signals command;

whereby to get robust performance of the process against diameter fluctuations and shape changes of the said preform, and to get robust diameter-controlled optical fiber.

31. (previously presented) The control method in claim 30, wherein

said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation.

32. (previously presented) The control method in claim30, wherein

said optical fiber measurement device as a first bare fiber outer diameter measurement device is located near a furnace for said heating and melting stage, and the measured optical fiber is bare ;

said control method further includes:

locating a second bare fiber outer diameter measurement device after the first bare fiber measurement device and before a coating device in which the fiber is coated;

providing said control system with a second bare fiber diameter measurement from the second bare fiber measurement device;

calculating a second bare fiber diameter deviation of the measured second bare fiber diameter from a preselected second nominal fiber diameter value which is less than the first nominal fiber diameter value; and wherein

said control signals are further based on this second bare fiber diameter deviation.

33. (previously presented) The control method in claim 32, wherein

said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation; and

the control signals are further calculated by an algorithm for said adjusting the feeding speed by an adjustment Δv_f to satisfy

$$\Delta v_d = [v_f \cdot (2D \cdot \Delta D + \Delta D^2) + \Delta v_f \cdot (D + \Delta D)^2] / d^2$$

where ΔD is the preform diameter deviation, $D+\Delta D$ is the measured preform diameter, D is the nominal perform diameter, v_f is a predetermined perform feeding speed, Δv_d is an adjustment of the drawing speed, and d is the nominal fiber diameter;

whereby to robustly control performance of said drawing process and quality of said optical fiber diameter against the deviation of the preform, various disturbances and perturbations affecting on the bare fiber diameter in the fiber drawing process.

34. (previously presented) The control method as claimed in Claim 33, wherein the control signals are further based on historical measurement data of the preform and the bare fiber being drawn over a period;

whereby the process control provides robust performance of the drawing process and robust quality of the fiber further against the fluctuations of the diameters, time-lag and time-lead of said measurements corresponding to the heating and melting stage, and environment fluctuations of the heating and melting.

35. (previously presented) The control method in claim 32, wherein

said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation;

whereby to robustly control performance of said drawing process and quality of said optical fiber diameter against the deviation of the preform, various disturbances and perturbations affecting on the bare fiber diameter in the fiber drawing process.

36. (previously presented) The control method as claimed in Claim 35, wherein the control signals are further based on historical measurement data of the preform and the bare fiber being drawn over a period;

whereby the process control provides robust performance of the drawing process and robust quality of the fiber further against the fluctuations of the diameters, time-lag and time-lead of said measurements corresponding to the heating and melting stage, and environment fluctuations of the heating and melting.